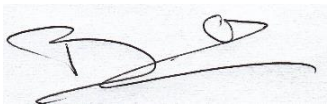
	Curriculum Document		
Occupational Code	**Qualification Title**	**NQF Level**	
671301-002	**Railway Traction Line Worker**	**4**	

	Name	Email	Phone	Logo
Development Quality Partner	**Transport Education and Training Authority (TETA)**	**Physical Address**: TETA House 344 Pretoria Avenue| Randburg | Gauteng **Postal Address**: Private Bag X10016 Randburg 2125 **Telephone**: (011) 577-7000/ 7040 **Fax**: 086 76 505 14		
Assessment Quality Partner	**National Artisan Moderating Body (NAMB)**	http://www.dhet.gov.za	012 312 5911 0800 87 2222 086 999 0123	

Learner QDF Signature **Date**



QDF Signature **Date**

DQP Representative Signature **Date**

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SECTION 1: CURRICULUM SUMMARY

1. Occupational Information

The following analysis indicate where the occupation is situated on the OFO

OFO Unit Group: 6713 - Electrical Line Installers and Repairers

Electrical line installers and repairers install repair and join electrical transmission and supply cables and related equipment.

Tasks:

- Installing and repairing overhead and underground electrical power and electrical traction lines
- Making joints in overhead and underground cables
- Adhering to safety practices and procedures such as checking equipment regularly and erecting barriers around work areas
- Opening switches or attaching grounding devices to remove electrical hazards from disturbed or fallen lines to facilitate repairs
- Climbing poles or using truck-mounted buckets to access equipment
- Identifying defective sectionalizing devices circuit breakers fuses voltage regulators transformers switches relays or wiring using wiring diagrams and electrical-testing instruments

OFO Occupation: 671301 - Electrical Linesworker Electrical Line Mechanic

Installs maintains repairs and patrols electrical sub-transmission and distribution systems.

Alternative Titles:

- Electric Cable Layer Puller
- Electric Power Lines Faultsman Serviceman
- Electrical Inspector Lines
- Electrical Line Mechanic Distribution)
- Electrical Line Mechanic Transmission)
- Linesman
- Lines Inspector
- **Railway Traction Line Worker**
- Signals and Electric Line Inspector

Occupation or Specialisation Addressed by this Curriculum

- **671301-002-00-00-** Railway Traction Line Worker

1.1 Associated Occupation

671301: Railway Traction Line Worker

1.2 Occupation or Specialisation Addressed by this Curriculum

671301-002-00-00: Railway Traction Line Worker

1.3 Alternative Titles used by Industry

- Railway Linesman

2. Curriculum Information

2.1 Curriculum Structure

This qualification is made up of the following compulsory Knowledge and Practical Skill Modules:

Knowledge Modules:

Number	Title	NQF Level	Credits
671301-002-KS- 01	General principles of overhead track equipment maintenance;	**2**	**36**
671301-002-KS- 02	Fundamental principles of overhead track equipment construction and maintenance;	**3**	**57**
671301-002-KS- 03	Specialised principles of overhead track equipment construction and maintenance.	**4**	**55**

Total number of credits for Knowledge Modules: 148

Practical Skill Modules:

Number	Title	NQF	Credits
671301-002-PM- 01	Maintain overhead track structures and return circuits.	**2**	**57**
671301-002-PM- 02	Perform earthing and bonding on traction systems and transmission lines.	**3**	**20**
671301-002-PM- 03	Afford on-track protection	**2**	**5**
671301-002-PM- 04	Under Supervision perform construction and maintenance of overhead track equipment under isolated and earthed	**3**	**98**
671301-002-PM- 05	Inspect, do fault finding, installation, repair and adjustment of OHTE under live and/or isolated and earthed conditions.	**4**	**17**
671301-002-PM- 06	Work under isolated and earth conditions and to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC overhead traction equipment (OHTE) and all transmission lines and associated equipment) with a mechanised vehicle/on track machine.	**4**	**52**

Total number of credits for Practical Skill Modules: 249

Work Experience Modules:

Number	Title	NQF Level	Credits
671301-002-WM-01	Overhead track equipment maintenance processes	**2**	**59**
671301-002-WM-02	Processes for constructing and maintaining overhead track equipment	**3**	**66**
671301-002-WM-03	Specialised OHTE construction and maintenance processes	**4**	**48**

Total number of credits for Work Experience Modules: 173

TOTAL CREDITS FOR THE QUALIFICATION		**570**
KNOWLEDGE	25.52%	**148**
PRACTICAL SKILLS	44.66%	**249**
WORK EXPERIENCE	29.83%	**173**

NQF LEVEL 2	**27.54%**	**157**
NQF LEVEL 3	**42.28%**	**241**
NQF LEVEL 4	**30.18%**	**172**
TOTAL		**570**

2.2 Entry Requirements

NQF level 1 with English communication and maths literacy; Compliance with the medical fitness requirements for employment as a railway worker.

3. Assessment Quality Partner Information

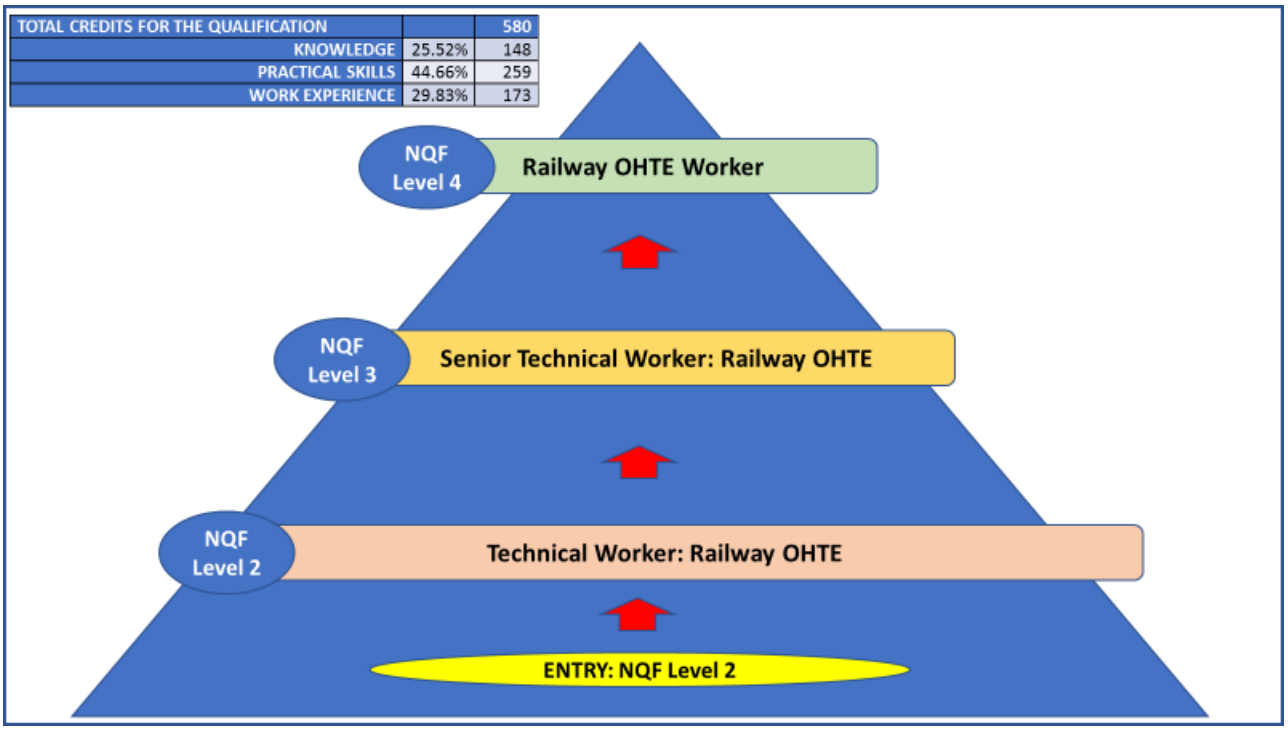
Name of body: National Artisan Moderating Body (NAMB).

Address of body: vanstaden.G@dhet.gov.za

Contact person name: G van Staden

Contact person work telephone number: 011 2061123

4. Part Qualification Curriculum Structure



FULL TRADE: 671301-002-00-00 Railway Traction Line Worker, NQF Level 4, Credits 570

Part Qualification 1:

Title:

671301-002-00-01 **Railway OHTE Technical Worker**, NQF Level 2, Credits 151

Purpose:

To provide basic technical support to the OHTE construction and maintenance service and experience and execute basic cleaning, maintenance, painting and related technical work.

Entry Requirement

NQF level 1 with English communication and maths literacy; Compliance with the medical fitness requirements for employment as a railway worker.

Applicable Modules (Rules of Combination)

Knowledge Modules:

671301-002-KM- 01	General principles of overhead track equipment maintenance NQF Level 2, Credits 36;

Total number of credits for Knowledge Modules: 30

Practical Skill Modules:

671301-002-PM- 01	Maintain overhead track structures and return circuits. NQF Level 2, Credits 57
671301-002-PM- 03	Afford on-track protection NQF Level 2, Credits 5.

Total number of credits for Practical Skill Modules: 62

Work Experience Modules:

671301-002-WM-01	Overhead track equipment maintenance processes NQF Level 2, Credits 59.

Total number of credits for Work Experience Modules: 59

Part Qualification 2:

Title:

671301-002-00-02 **Railway OHTE Technical Assistant**, NQF Level 3, Credits 241

Purpose:

To execute technical work within the railway OHTE construction and maintenance environment under supervision.

Entry Requirement

Successful completion of Part Qualification 01 (671301-002-00-01 Technical Worker: Railway OHTE, NQF Level 2).

Applicable Modules (Rules of Combination)

Knowledge Modules:

671301-002-KS- 02	Fundamental principles of overhead track equipment construction and maintenance; NQF Level 3, Credits 57.

Total number of credits for Knowledge Modules: 57

Practical Skill Modules:

671301-002-PM- 02	Perform earthing and bonding on traction systems and transmission lines. NQF Level 3, Credits 20;
671301-002-PM- 04	Under Supervision perform construction and maintenance of overhead track equipment under isolated and earthed conditions, NQF Level 3, Credits 98.

Total number of credits for Practical Skill Modules: 118

Work Experience Modules:

671301-002-WM-02	Processes for constructing and maintaining overhead track equipment NQF Level 3, Credits 66

Total number of credits for Work Experience Modules: 66

SECTION 2: OCCUPATIONAL PROFILE

1. Occupational Purpose

To construct and maintain high voltage electrical overhead traction equipment network and DISTRIBUTION network within the railway infrastructure environment.

2. Occupational Tasks

- **TASK 01:** Execute basic technical support work on overhead track equipment. (NQF Level: 2)
- **TASK 02:** Execute advanced technical support work on overhead track equipment (NQF Level: 3)
- **TASK 03:** Operate as a traction lines-person (NQF Level: 4)

3. Occupational Task Details

3.1. TASK 01: Execute basic technical support work on overhead track equipment.

Unique Product or Service

- Safely and correctly perform general maintenance such as cleaning, painting, bonding and earthing on overhead track equipment and return circuits and overhead track structures to the required standards.

Occupational Responsibilities

- Maintain overhead track structures and return circuits;
- Perform earthing and bonding on traction systems and transmission lines; and
- Afford on-track protection

Context

- Overhead track equipment maintenance processes

3.2. TASK **02: Execute advanced technical support work on overhead track equipment.**

Unique Product or Service

- Safely and correctly remove, assemble, replace/install and maintain Overhead Track Equipment to the required standards and specifications under supervision.

Occupational Responsibilities

- Under Supervision perform construction and maintenance of overhead track equipment under isolated and earthed conditions.

Context

- Processes for constructing and maintaining overhead track equipment

3.3. TASK **03: Operate as a traction lines-person**

Unique Product or Service

- Enable safe and timeous repair on overhead track equipment, maintenance personnel must have a sound knowledge of various overhead track systems and must follow predetermined faultfinding and repair procedures based on overhead track engineering practices and specifications.

Occupational Responsibilities

- Inspect, do fault finding, installation, repair and adjustment of OHTE under live and/or isolated and earthed conditions.
- Work under isolated and earth conditions and to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC overhead traction equipment (OHTE) and all transmission lines and associated equipment) with a mechanised vehicle/on track machine.

Context

- Specialised OHTE construction and maintenance processes

SECTION 3: CURRICULUM COMPONENT SPECIFICATIONS

SECTION 3A: KNOWLEDGE MODULE SPECIFICATIONS

List of Knowledge Modules for which Specifications are included

Number	Title	NQF Level	Credits
671301-002-KM- 01	General principles of overhead track equipment maintenance	**2**	**30**
671301-002-KM- 02	Fundamental principles of overhead track equipment construction and maintenance	**3**	**77**
671301-002-KM- 03	Specialised principles of overhead track equipment construction and maintenance.	**4**	**24**

Total number of credits for Knowledge Modules: 131

1. 671301-002-KM-01: General principles of overhead track equipment maintenance, NQF Level 2, Credits 30.

1.1. Purpose of the Knowledge Module

To build learners knowledge and understanding to enable them to work safely within the overhead track construction and maintenance environment and to execute general maintenance support duties such as cleaning, painting, bonding and earthing.

Topics included in this module:

TOPIC NUMBER	TOPIC TITLE	WEIGHT	CREDITS
671301-002-KM-01:01	Overhead railway power-line construction practices	**30**	**15**
671301-002-KM-01:02	113877 Understand fundamentals of electricity	**8**	**2**
671301-002-KM-01:03	9839 Apply and maintain safety in an electrical environment	**20**	**5**
671301-002-KM-01:04	116900 Apply electrical high voltage safety instructions when working near exposed live high- voltage overhead track equipment	**20**	**1**
671301-002-KM-01:05	115234 Demonstrate knowledge of electrical safe working practices	**20**	**2**
671301-002-KM-01:06	12037 Demonstrate knowledge of mechanical and electrical equipment	**20**	**4**
671301-002-KM-01:07	119882 Demonstrate an understanding of the electrical environment in the rail sector	**20**	**1**

TOTAL TOPIC CREDITS: **30**

1.2. Guidelines for Topics

1.2.1. 671301-002-KM-01:01: Overhead railway power-line construction practices

Topic elements to be covered include:

KT0101: Principles of concrete practice (Components of concrete, Strengths of concrete and their uses, Methods of making, compacting and curing concrete, Methods of placing and finishing concrete, Sampling and testing of concrete, Purpose of reinforcement and form-work, Considerations behind batching concrete);

KT0102: Rigging and lifting equipment used in line construction work - (Principles of rigging, Types and properties of rigging equipment, rigging practices, Safe use and care of rigging equipment, Types of lifting equipment and their application, Safe use and care of lifting equipment, Relevance of safe working loads, Precautions in the use of lifting equipment, Stacking and storing of materials on construction sites);

KT0103: Gas heating and cutting principles - (Safe use and care of oxy-acetylene cutting and heating

components and equipment, Storage and transport of oxy-acetylene cutting and heating equipment, Principles of basic welding and welding practices);

KT0104: Earthing and bonding - (Principles of earthing and bonding; Methods of earthing and bonding low voltage Overhead Lines Mechanic, equipment and cables; and Regulatory and statutory requirements related to earthing and bonding).

Internal Assessment Criteria

IAC0101: Given various construction scenarios learners must be able to indicate what concrete practices will apply and describe the processes for mixing, compacting, curing and finishing concrete work in each of the situations;

IAC0102: Given various scenarios where material, components and equipment must be lifted and moved by mechanical means learners will be able to identify the most appropriate lifting methods and describe the appropriate practices and procedures for lifting and moving the items.

IAC0103: a. Define earthing and bonding and explain the purpose thereof;
b. Explain the regulatory requirements for earthing and bonding;
c. Explain the regulatory requirements for the earthing of neutral conductors on both the supplier and consumer side of an installation;
d. Explain the term systems earthing;
e. Describe the earthing systems relevant to SANS 10142-1 power stations and substations;
f. Describe how a common earth electrode is used in reticulation circuits;
g. Describe the provision of earthing for underground cables and Overhead Lines;
h. Explain the various processes of measuring, testing and calculating earthing and bonding system values.

IAC0104: Describe and explain the safe use, care and storage of oxy-acetylene cutting and heating components and equipment.

1.2.2. 671301-002-KM-01:02 Understand fundamentals of electricity

Topic Elements to be covered include:

KT0201: Electron theory;
KT0202: Series, parallel and series-parallel resistive circuits;
KT0203: Fundamentals of power generation and distribution;
KT0204: Magnetic theory;
KT0205: OHMs law

Internal Assessment Criteria:

IAC0201: **Explaining the electron theory;**

a. Electrical units and symbols are identified and applied in accordance with SI Units.
b. The relationship between voltage, current and resistance is explained and applied in terms of Ohms law.
c. Factors influencing resistance is explained in terms of material type, length, diameter and temperature.
d. Power consumed by a simple resistive electrical circuit is calculated in terms of DC

IAC0202: **Explain the fundamentals of power generation and distribution;**

a. The production of electricity is explained with reference to pressure, heat, light, friction, magnetism and chemical.
b. The conversion of resources into usable energy is explained with reference to coal, gas, nuclear, water, wind and solar.
c. Generation of DC is explained in terms of a single loop in a magnetic field.
d. Generation of single phase AC is explained in terms of a single loop in a magnetic field.

IAC0203: **Explain magnetic theory**;

a. Permanent magnet concept is explained in terms of the molecular structure of materials.
b. All five characteristics of magnetic lines of flux are explained in terms of magnetic theory.
c. The relationship between magnetic field and current flow is explained in terms of movement, field strength and conductor length within the magnetic field.
d. The electromagnet concept is explained in terms of magnetic lines of flux around a current carrying conductor and cores.
    i. Atomic structures are explained in terms of electrical materials.
    ii. Electron flow in a conductor is explained with reference to electron theory.
    iii. The effect of an external power source on the electrons in a conductor is explained with reference to electron theory.
    iv. The principles of basic electrical circuits are explained in terms of a power source and a load.
    v. The basic principles of voltage and current flow in an electrical circuit are explained in terms of electron theory.

IAC0204: **Apply OHMs law to solve problems.**

a. Series, parallel and series-parallel circuits are drawn and interpreted according to instructions.
b. Resistance, voltage, current and power variances are interpreted and calculated in series circuits according to instructions.
c. Resistance, voltage, current and power variances are interpreted and calculated in parallel circuits according to instructions.
d. Resistance, voltage, current and power variances are interpreted and calculated in series-parallel circuits according to instructions.

1.2.3. 671301-002-KM-01:03 Apply and maintain safety in an electrical environment

Topic Elements to be covered include:

KT0301: Safety signs, regulations and procedures related to a working environment;
KT0302: Safety equipment;
KT0303: Safety procedures before, during and after job processes;
KT0304: Safety anomalies.

Internal Assessment Criteria:

IAC0301: **Adhere to safety signs, regulations and procedures related to a working environment.**

a. Personal protective equipment is selected for a specific job.
b. Safety procedures are followed for a specific job.
c. Applicable statutory requirements are adhered to.
d. Safety signs and procedures are correctly interpreted.
e. The consequences of incorrect usage of safety procedures and personal safety equipment are explained.

IAC0302: **Care for safety equipment.**

a. Safety equipment is examined for damage or faults in accordance with worksite procedures.
b. Report and record of faulty safety equipment in accordance with work site procedures.
c. Safety equipment is cleaned, cared for and stored safely and according to worksite procedures.
d. Procedures for dealing with damaged or faulty equipment are adhered to.
e. The importance of maintaining and carefully storing safety equipment is explained in terms of work site procedures.

IAC0303: **Follow appropriate safety procedures before, during and after job processes**.

a. The appropriate safety procedures are followed for the activity being undertaken according to worksite procedures.
b. The use of appropriate personal protective equipment is demonstrated during the activity.
c. Disposal of waste materials generated during the activity is demonstrated to meet environmental requirements.
d. Reasons for using specific safety procedures and personal protective equipment is explained in terms of work site procedures.

IAC0304: **Report and record safety anomalies in accordance with worksite procedures**.
Report and record safety anomalies in accordance with worksite procedures, statutory requirements and or manufacturers specifications.

a. Unsafe conditions are recognised.
b. Recording and reporting procedures are correctly followed.
c. Dangers related to incorrect reporting are explained.
d. Suitable recommendations are made.

1.2.4. 671301-002-KM-01:04 Apply electrical high voltage safety instructions when working in near exposed live high-voltage overhead track equipment.

Topic Elements to be covered include:

KT0401: Safety signs, regulations and procedures related to a working environment;
KT0402: Safety equipment;
KT0403: Safety procedures before, during and after job processes;
KT0404: Safety anomalies.

Internal Assessment Criteria:

IAC0401: **Adhere to safety signs, regulations and procedures related to a working environment.**

a. Personal protective equipment is selected for a specific job.
b. Safety procedures are followed for a specific job.
c. Applicable statutory requirements are adhered to.
d. Safety signs and procedures are correctly interpreted.
e. The consequences of incorrect usage of safety procedures and personal safety equipment are explained.

IAC0402: **Care for safety equipment.**

a. Safety equipment is examined for damage or faults in accordance with worksite procedures.
b. Report and record of faulty safety equipment in accordance with work site procedures.
c. Safety equipment is cleaned, cared for and stored safely and according to worksite procedures.
d. Procedures for dealing with damaged or faulty equipment are adhered to.
e. The importance of maintaining and carefully storing safety equipment is explained in terms of work site procedures.

IAC0403: **Follow appropriate safety procedures before, during and after job processes.**

a. The appropriate safety procedures are followed for the activity being undertaken according to worksite procedures.
b. The use of appropriate personal protective equipment is demonstrated during the activity.
c. Disposal of waste materials generated during the activity is demonstrated to meet environmental requirements.
d. Reasons for using specific safety procedures and personal protective equipment is explained in terms of work site procedures.

IAC0404: **Report and record safety anomalies in accordance with worksite procedures.**
OUTCOME NOTES Report and record safety anomalies in accordance with worksite procedures, statutory requirements and or manufacturers specifications.

a. Unsafe conditions are recognised.
b. Recording and reporting procedures are correctly followed.
c. Dangers related to incorrect reporting are explained.
d. Suitable recommendations are made.

1.2.5. 671301-002-KM-01:05 Demonstrate knowledge of electrical safe working practices

Topic Elements to be covered include:

KT0401: General principles and precautions relating to working safely in the electrical industry;
KT0501: Safety clothing and safety equipment as used in the electrical industry;

KT0501: Safe use of tools and equipment in the electrical industry;
KT0501: Electrical hazards and safety precautions;
KT0501: Procedures in relation to fires in electrical equipment;
KT0501: Reporting electrical accidents;
KT0501: Safety tag system.

Internal Assessment Criteria:

IAC0501: **Demonstrate knowledge of general principles and precautions relating to working safely.**

a. Demonstrate knowledge of the general principles and precautions relating to working safely in the electrical industry.
b. The responsibilities of the individual in relation to personal safety and the safety of others
c. are identified and described in accordance with current legislation and site policies.
d. The warning and reporting procedures of unsafe situations in the workplace are explained in line with site regulations.
e. The need for all electrical work to be performed by competent personnel in accordance with legislation, regulations, codes of practice, and standards is identified in relation to current policies and legislation.
f. The importance of the planning of all work, and of communicating clearly with others is explained.
g. Situations in which a second competent person must be present are identified.

IAC0502: **Demonstrate knowledge of safety clothing and safety equipment as used in the electrical industry.**

a. Items of safety clothing and safety equipment are identified, and reasons given as to why and under what circumstances each item is to be used.
b. Items may include: overalls, undergarments, shoes, eye protection, safety helmets, rubber gloves, rubber mats, safety belts.
c. The danger of wearing metallic items while working on or near live equipment or conductors is explained in terms of personal and or team safety.

IAC0503: **Demonstrate knowledge of the safe use of tools and equipment in the electrical industry.**

a. The practices relating to the safe use of tools are stated in accordance with site policy.
b. The practices relating to the safe use of measuring and test instruments are stated.
c. The need to check currency of test certification of certain equipment is explained in relation to personal safety and test validity.
d. The principles relating to the safe use of ladders are explained in terms of personal safety.

IAC0504: **Demonstrate knowledge of electrical hazards and safety precautions.** ASSESSMENT

a. The nature of electric shock is explained in terms of how it may arise, its physiological effect, and the effects of different voltage and current.
b. The hazards of short circuits and uncontrolled fault currents are explained in relation to safety of personnel and/or equipment.
c. The safety precautions and procedures for the prevention of electric shock are stated and match site procedures and accepted best practice.

IAC0505: **Demonstrate knowledge of procedures in relation to fires in electrical equipment.**

a. The importance of following site evacuation and firefighting procedures is explained in terms of mininising injury and/or damage to property.
b. The importance of disconnecting the power supply to burning equipment is explained in terms of its impact on the fire and damage limitation.
c. The danger of toxic gases given off by fires in electrical equipment is identified, and the manner of dealing with such is stated.
d. Fire extinguishers suitable for use on electrical equipment are identified and distinguished from those not suitable for use.

IAC0506: **Demonstrate knowledge of reporting of electrical accidents**. ASSESSMENT CRITERIA

a. The types of electrical accidents which must be reported are stated in accordance with current regulations.
b. The procedures and details of reporting electrical accidents are stated in accordance with current regulations.
c. Demonstrate knowledge of the safety tag system.
d. The types of tags are stated.
e. Types of tags may include: danger, warning, beware, and caution tags; out-of-service tags;
f. hold cards; in-house tags used for the same effects.
g. Procedures for the placement and removal of tags are explained in accordance with industry practice and site policy.
h. A tag system for use in a multi-trade environment is described in terms of its application and key features.

1.2.6. 671301-002-KM-01:06 -12037 Demonstrate knowledge of mechanical and electrical equipment

Topic Elements to be covered include:

KT0601: Function and operation of pumps;
KT0601: Function and operation of valves;
KT0601: Function and operation of blowers and compressors;
KT0601: Monitoring and maintenance procedures for mechanical equipment;
KT0601: Safe operation of electrical equipment.

Internal Assessment Criteria:

IAC0601: **Explain the function and operation of pumps**
a. Pumps are identified.
b. The function of pumps is explained.
c. Safe operation of pumps is explained.

IAC0602: **Explain the function and operation of valves**
a. Valves are identified.
b. The purpose of valves is explained.
c. Safe operation of valves is explained.

IAC0603: **Explain the function and operation of blowers and compressors**
a. Blowers and compressors are identified.
b. The purpose of blowers and compressors is explained.
c. Safe operation of blowers and compressors is explained.

IAC0604: **Explain monitoring and maintenance procedures for mechanical equipment**
a. Monitoring procedures are explained.
b. Maintenance procedures are explained.

IAC0605: **Explain safe operation of electrical equipment**
a. Principles of electric shock are explained.
b. Cleaning procedures for electrical equipment are explained.
c. Access control to electrical installations is explained.
d. Safety procedures when operating electrical equipment are explained.
e. Control of electrical fires is explained.

1.2.7. 671301-002-KM-01:07 Demonstrate an understanding of the electrical environment in the rail sector

Topic Elements to be covered include:

KT0701: Demonstrate an understanding of the electrical environment in the rail sector;
KT0702: Work safely near low/high-voltage electrical systems; and
KT0703: Identify and report related sub-standards conditions.

Internal Assessment Criteria:

IAC0701: **Demonstrate an understanding of the rail and OHTE environment.**

a. The rail environment is explained with examples.

The OHTE or Sub-station environment is explained with examples.

IAC0702: **Work safely near low/high-voltage electrical systems.** ASSESSMENT CRITERIA

a. Personal electrical safety definitions are explained fully.
b. The purpose of the electrical safety instructions is explained in detail.
c. The specific electrical safety instructions applicable are explained and applied fully.
d. The consequences of not conforming to safety instructions are explained clearly.
e. Material and equipment are safely handled according to company specific electrical safety instructions.
f. Various electrical signs and warning boards are identified, and the meaning thereof is explained with examples.
g. Sub-standard conditions are identified and reported in accordance with company-specific electrical safety instructions.

Provider Accreditation Requirements for the Module:

Physical Requirements:

- Normal lecture facilities
- Access to a simulated or controlled work environment

Human Resources Requirements:

- Facilitator of learning must have at least three years practical experience in the field of overhead track equipment construction and maintenance
- The Facilitator/learner ratio must not exceed 1/20

Legal Requirements:

- Compliance with the normal legislative requirements that apply to public training facilities

2. 671301-002-KM-02: Fundamental principles of overhead track equipment construction and maintenance

2.1. Purpose of the Knowledge Module

To build the knowledge and understanding of learners to enable them to safely and correctly remove, assemble, replace/install and maintain Overhead Track Equipment to the required standards and specifications under supervision.

Topics included in this module:

TOPIC NUMBER	TOPIC TITLE	CREDITS
671301-002-KM-02:01	The Occupational context	**8**
671301-002-KM-02:02	Concepts and general application principles of tools and equipment use	**12**
671301-002-KM-02:03	Power-line construction health, safety, environment and quality fundamentals	**25**
671301-002-KM-02:04	10894 Interpret electrical circuits	**2**
671301-002-KM-02:05	Principles and concepts associated with power-line construction in the railway sector	**25**
671301-002-KM-02:06	116438 Operate earthing devices on electrical networks	**5**

TOTAL TOPIC CREDITS: **77**

2.2 Guidelines for Topics

2.2.1. 671301-002-KM-02:01 The Occupational context

Topic Elements to be covered include:

KT0101: Overview of the railway sector and its intended contribution towards achieving sustainable growth and quality of life in line with the national development strategy;

KT0102: The changing world of work and the nature and challenges of working within the overhead railway track construction and maintenance environment;

KT0103: Fundamental principles and challenges associated with electrical line construction work;

KT0104: Professional ethics and standards associated with a trades-person;

KT0105: The legislated requirements and processes associated with apprentices and becoming a qualified trades-person;

KT0106: Overview of the occupational health, safety and environmental frameworks and requirements when working within a construction and electrical environment;

Internal Assessment Criteria:

IAC0101: Reflect on the role of the railway overhead line equipment worker in relation to how this job contributes towards the success of the nation and the achievement of our national development goals; (Weight: 15%)

IAC0102: Describe the nature of the work associated with the construction and maintenance of railway overhead track equipment and indicate the importance of ongoing skills development in an ever-changing technological age; (Weight: 15%)

IAC0103: Explain the physical, mental and environmental challenges associated with the work of a Railway overhead line equipment worker, describe the structure and roles of the various players within the work organisation; (Weight: 20%)

IAC0104: Describe the role and training of tradespeople and indicate what legislative requirements there are relating to training, trade tests and the ongoing professional development of trades-persons; (Weight: 20%)

IAC0105: Explain the basic requirements of relevant occupational health, safety and environmental protection legislation and give practical examples of how this is applied within the work situation. (Weight: 30%)

2.2.2. 671301-002-KS-02:02 Concepts and general application principles of tools and equipment use (Credits: 12)

Topic Elements to be covered include:

KT0201: Hand tools and portable power tools;

KT0201: Measuring instruments (Portable electrical measuring instruments, Types of electrical measuring and testing instruments and their purpose, Safe use of measuring and testing instruments, Operating principles of measuring and testing instruments, Methods of connecting measuring and testing instruments in circuits, Applications and methods of using electrical measuring and test instruments, Care and maintenance of measuring and testing instruments)

Internal Assessment Criteria:

IAC0201: Identify and describe the use of the different hand and portable power tools that are generally used in the execution of work within this occupation; (Weight: 20%)

IAC0202: Identify different types of portable electrical measuring instruments fixed and state the purpose; (Weight: 20%)

IAC0203: Identify the basic components of various measuring and test instruments and describe the basic principle of operation; (Weight: 20%)

IAC0204: Describe the applications and methods of using electrical measuring and testing instruments in DC and AC circuits; (Weight: 20%)

IAC0205: Describe safety and functionality checks to be performed on measuring and testing equipment before use; (Weight: 10%)

IAC0206: Describe correct methods of handling and storing measuring and testing equipment (Weight: 10%)

2.2.3. 671301-002-KS-02:03 Power-line construction health, safety, environment and quality fundamentals (Credits: 25)

Topic Elements to be covered include:

KT0301: Environmental management - (Environmental law, Hazardous substances, Identification of trees, Protected areas and sensitive environments, Environmental impacts and requirements, Environmental impact assessments and management plans, Vegetation management, Protected species, Principles of rehabilitation);

KT0301: Electrical and construction health and safety - (Construction regulations, High voltage regulations, Site safety practices);

KT0301: Quality management - (Definitions of quality, Quality and sustainability, Quality concepts, Principles of quality management, Quality assurance and quality control, Quality management systems, Role of national standards in quality management)

Internal Assessment Criteria:

IAC0301: **Reflect on the environmental management applicable to the workplace**

a. Describe and explain the concepts and purposes of environmental legislation, regulations and related processes

b. Describe and explain the purpose of environmental impact assessment studies and environmental management plans

c. Describe and explain the impacts of human activities and hazardous substances on the environment

IAC0302: **Identify and describe the applicable regulatory requirements**

a. Describe and explain the concepts and purposes of construction regulations;

b. Describe and explain the concepts and purposes of high voltage regulations;

c. Describe and explain safety practices at overhead line construction work sites.

IAC0303: **Explain the concepts and principles of quality work**

a. Describe and explain the concepts and purposes of quality and quality management;

b. Describe and explain possible impacts of non-conformance;

c. Describe and explain the importance of standards and procedures.

2.2.4. 671301-002-KS-02:04 Interpret electrical circuits (Credits: 2)

Topic Elements to be covered include:

KT0401: Symbols and concepts in an electrical circuit;

KT0401: Effects and relationships between circuit variables.

Internal Assessment Criteria:

IAC0101: **Define symbols and concepts in an electrical circuit.**

a. Symbols of components, terms, abbreviations and SI -units defined.
b. Use of switches in an electrical circuit described.
c. Electrical concepts defined.
d. Power, power loss and energy.

IAC0101: **Identify the effects and relationships between circuit variables.**

a. Effect of load on the circuit with reference to current flow and voltage drop calculated. ASSESSMENT
b. Elementary calculation and measurement.
c. Relationship between voltage, current and resistance interpreted.
d. Open, closed and short circuits, resistance in series/parallel circuits.
e. Use of measuring instruments comprehended.
f. Included but not limited to volt meter, ammeter and kilowatt-hour meter.

IAC0101: **Identify sources of circuit supply.**

a. Principles of alternating current (AC) generation described.
b. Principles of direct current (DC) generation described.
c. Construction of secondary cells known and understood.
d. Distribution configuration of circuit supply understood.
e. This should be done with the aid of distribution boards.
f. Distribution boards.

2.2.5. 671301-002-KS-02:05: Principles and concepts associated with power-line construction in the railway sector (Credits: 25)

Topic Elements to be covered include:

KT0501: Line and equipment earthing - (Types of earthing and their applications, Earthing requirements for line equipment, Methods of earthing, Methods of testing installed earthing)

KT0502: Components in power-line construction - (Types, function and application of overhead line insulators; Types, function and application of overhead line conductors; Types, function and application of overhead line connectors)

KT0503: Configuration of power-line structures - (Types of power-line structures; Types of stays and their application; Transmission, distribution and reticulation configurations)

KT0504: Induction on power-lines - (Types and causes of induction and methods of protection;

KT0505: Methods of protection against step and touch potential; and Purpose and methods of discharging capacitors)

Internal Assessment Criteria:

IAC0501: **Explain and describe line earthing equipment**

a. Explain the importance of earthing
b. Explain the concept of floating earths in portable appliances
c. Explain the earthing functions of system earthing, equipment earthing and a combination of system and equipment earthing
d. Describe the earthing systems for various types of line equipment
e. Describe how a common earth electrode is used;
f. Describe the earthing of underground cables;
g. Describe how earth continuity is provided using the cable sheath in cable terminations and joint boxes;

h. Describe the purpose of insulated glands in a cable system;
i. Describe the methods by which protective earthing is affected for direct earthing of all metalwork concerned, and direct metallic connection between metalwork and the neutral at the source of supply;
j. Describe the earthing method of a separate wire to which all non-current carrying metal work is connected;
k. Describe the methods of testing on completion of installing earthing.

IAC0502: **Reflect on the use of insulators**
a. Explain the function and application of various types of overhead line insulators;
b. Explain the function and application of various types of overhead line conductors;
c. Explain the function and application of various types of overhead line connectors.

IAC0503: **Explain the various power line structures**
a. Describe and explain various types of power-line structures;
b. Describe and explain various types of stays and their application;
c. Describe and explain various types of stays and their application

IAC0504: **Reflect on induction within the electrical environment**
a. Describe and explain types and causes of induction and methods of protection;
b. Describe and explain methods of protection against step and touch potential; and
c. Describe and explain the purpose and methods of discharging capacitors.

2.2.6. 671301-002-KS-02:06; Operate earthing devices on electrical networks (Credits: 5)

Topic Elements to be covered include:

KT0601: Safely operate electrical apparatus;
KT0602: Stabilize transient conditions;
KT0603: Service plant; monitor plant;
KT0604: Maintain regulatory requirements;

Internal Assessment Criteria:

IAC0601: **Operate electrical apparatus.**
a. Equipment is verified to be ready for service prior to operation according to administrative requirements
b. Electrical operations on apparatus performed according to operating requirements.
c. Out of normal conditions identified, reacted upon and communicated according to operating requirements
d. Necessary tools and or equipment obtained to operate apparatus according to operating requirements

IAC0602: **Stabilise transient emergency conditions.**
a. Emergency conditions are acknowledged, immediate situation analysed and acted upon according to procedural requirements
b. Operating activities are priorities during transient conditions according to requirements
c. Emergency conditions are communicated according to administrative requirements

IAC0603: **Sustain testing equipment operability.**
a. Tools and or equipment to service or operate electrical apparatus is tested for safe operability, according regulatory procedures
b. Servicing activities are communicated according to administrative requirements
c. Housekeeping standards are maintained according to work place procedures

IAC0604: **Maintain safety and regulatory requirements.**
a. Regulatory requirement relevant to the operation of earthing devices are adhered to.
b. Personal protective equipment required to perform relevant operations on earthing devices is used according to organisational standards
c. Safety hazards are communicated according to organisational standards.

IAC0605: **Demonstrate knowledge and understanding of earthing devices.**

a. Priority setting during plant operations is understood.
b. Electrical plant components application and interrelation to the plant is known and understood according to relevant theories.
c. Incidents and trends related to specific plant operation are known and understood.
d. Operating philosophies pertaining to plant operating procedures are known and understood

2.3. Provider Accreditation Requirements for the Module:

Physical Requirements:
- Normal lecture room facilities
- Access to a simulated or controlled work environment

Human Resources Requirements:
- Facilitator of learning must have at least three years practical experience in the field of overhead traction equipment construction and maintenance
- Facilitator/Learner ratio must not exceed 1/20

Legal Requirements:
- Compliance with normal regulatory requirements applicable to public training facilities

3. 671301-002-KS-03: Specialised principles of overhead track equipment construction and maintenance.

3.1. Purpose of the Knowledge Module

To build the knowledge and understanding of learners to enable them to execute safe and timeous repair on overhead track equipment, maintenance personnel must have a sound knowledge of various overhead track systems and must follow predetermined faultfinding and repair procedures based on overhead track engineering practices and specifications.

Topics included in this module:

TOPIC NUMBER	TOPIC TITLE	CREDITS
671301-002-KM 03:01	14057 Demonstrate knowledge and understanding of electrical systems and related concepts	4
671301-002-KM 03:02	120216 Obtain, issue and cancel a work permit	6
671301-002-KM 03:03	113873 Understand basic electrical and mechanical engineering principles	6
671301-002-KM 03:04	Concepts and principles of quality and quality management	4
671301-002-KM03:05	Theories associated with electricity and electrical installations	4

TOTAL TOPIC CREDITS: **24**

3.2 Guidelines for Topics

3.2.1. 671301-002-KS-03:01: Demonstrate knowledge and understanding of electrical systems and related concepts

Topic Elements to be covered include:

KT0101: Electrical supply systems;
KT0101: Electrical distribution systems;
KT0101: Capacitance and inductance in electrical systems;
KT0101: Switchgear and associated equipment (all voltages)

Internal Assessment Criteria:

IAC0101: **Know and understand electrical supply systems**

a. Describe Alternating and direct current
b. Direct current supply systems (DC) configuration described.
c. Two and three wire connections
d. Alternating current supply systems (AC) configuration described.
e. Two, three and four wire connections
f. Advantages/disadvantages of AC and DC supply systems explained.
g. Delta and star connection configurations identified.
h. Relationship between line and phase voltage in star and delta connection understood.

IAC0102: **Understand the types of electrical distribution systems**

a. Radial electrical system configuration interpreted.
b. Integrated (Ring main) electrical system configuration interpreted.
c. Load balancing principles in electrical systems understood.
d. Single and multi-phase

IAC0103: **Explain the effects of capacitance and inductance in electrical systems**

a. Basic operation of capacitors and inductors explained...
b. Effects of capacitance and inductance in electric systems explained.
c. Functional application of capacitors and inductors understood.

IAC0104: **Understand the working of switchgear and associated equipment (all voltages)**

a. Switchgear and associated equipment functions understood.

b. Included but not limited to links, breakers, contactors, fuses and switches.
c. Circuit breaker operating principles known.
d. Oil, air-break, compressed gas and air blast
e. Switch gear applications known and understood.

3.2.2. 671301-002-KS-03:02: Obtain, issue and cancel a work permit

Topic Elements to be covered include:
KT0301: Obtain work permit.
KT0302: Cancel work permit
Internal Assessment Criteria:
IAC0301: **Obtain work permit.**
a. Relevant portions of work permit are completed correctly according to company-specific electrical safety instructions.
b. Equipment to be isolated, work to be done, work limits
c. Permission to issue work permit is obtained from the electrical control office according to company-specific electrical safety instructions.
d. Work-permit number is confirmed with the electrical control office according to company specific electrical safety instructions.
e. Switching instructions are received, confirmed and executed correctly in accordance with work-permit procedures and instructions.
f. All prescribed time is recorded correctly according to company-specific electrical safety instructions.
IAC0302: **Cancel work permit.**
a. Relevant portions of work permit are completed correctly according to company-specific electrical safety instructions.
b. Work permit is cancelled correctly according to company-specific electrical safety instructions.
c. Equipment is handed back to the electrical control office correctly according to company-specific electrical safety instructions.
d. Switching instructions are received, confirmed and executed correctly in accordance with work-permit procedures and instructions.

3.2.3. 671301-002-KS-03:03; Understand basic electrical and mechanical engineering principles

Topic Elements to be covered include:
KT0301: Metric numbering system.
KT0302: Physics.
KT0303: Unit conversion

Internal Assessment Criteria:
IAC0301: **Use and describe SI, energy, electrical and mechanical quantities correctly.**
Force, torque, work done, velocity, acceleration, angular velocity, power, current, quantity of electricity, voltage, potential difference, electromotive force, electrical power, resistance, resistivity, temperature coefficient of resistance and conductivity.
a. Quantities are converted to their correct SI units.
b. Energy, electrical and mechanical units are defined, and its symbols listed correctly.
c. The difference between power energy and kWh is explained.
d. Basic battery theory is understood in terms of e.m.f., internal resistance, Ahr, Whr., and terminal voltage with the aid of basic calculations.
e. Resistance, voltage and current of single-and three phases, pure resistive AC circuits are measured, and power calculated with the aid of Ohms law.
IAC0302: **Understand and use DC theory and network analysis in solving RLC circuits.**

a. Series circuits with one supply are drawn and explained in relation with voltage, current and resistance values.
b. Parallel circuits with one supply are drawn and explained in relation with voltage, current and resistance values.
c. Series-and parallel circuits with one supply are drawn and explained in relation with voltage, current and resistance values.
d. Basic calculations of RLC circuits are done with the application of Kirchoff`s laws.

IAC0303: **Understand and apply magnetic theory.** ASSESSMENT CRITERIA

a. The laws of magnetic flux lines are defined in relation with the principles of magnetism.
b. Magnetic fields in various magnetic circuits are described in relation with the principles of electromagnetism. Toriod, core type, shell type and composite.
c. The direction of magnetic fields is determined and described with reference to screening,
d. leakage and fringing.
e. Magnetic units are named and applied with the aid of basic calculations.

IAC0304: **Understand electromagnetic theory**.

a. Magnetic fields produced by coils and conductors are described and sketched.
b. Fleming's left and right-hand rules are defined and applied.
c. Lenz`s law is defined and applied.
d. Induced e.m.f and rate of change are understood and applied.
e. Basic calculations related to electromagnetic theory are carried out.

IAC0305: **Understand capacitance theory**.

a. The operation of a capacitor is described in relation with different types and sizes.
b. Capacitance units are named and applied in relation with different types and sizes.
c. Electric field strength, electric flux density, permittivity of free space, dielectric, dielectric strength, relative permittivity and capacitance.
d. The relationship between capacitance and relevant variables are described.
e. Advanced calculations relevant to capacitance theory are carried out

IAC0306: **Understand alternating current theory**.

a. The difference between AC and DC is described with reference to the various generation machine configurations.
b. The principle of how AC e.m.f. is generated, is described as per AC theory principles.
c. Factors influencing the value of alternating voltage and current are described as per AC theory principles.
d. AC units are described and applied as per AC theory principles.
e. Cycle, frequency, wavelength, amplitude, peak and maximum values, peak tp peak value, sine wave, electrical degrees, r.m.s. and average values.
f. Factors influencing frequency are described as per AC theory principles.
g. Advanced calculations related to capacitance, inductance, reactance, impedance, power vars and power factor theory is carried out and explained as per AC theory principles

3.2.4. 671301-002-KS-03:04: Concepts and principles of quality and quality management

Topic Elements to be covered include:

KT0401: Definitions of quality
KT0402: Quality and sustainability
KT0403: Quality concepts;
KT0404: Principles of quality management;
KT0405: Quality assurance and quality control;
KT0406: Quality management systems;
KT0407: Role of national standards in quality management

Internal Assessment Criteria:

IAC0401: Describe and explain the concepts and purposes of quality and quality management;
IAC0402: Describe and explain possible impacts of non-conformance;

IAC0403: Describe and explain the importance of standards and procedures

3.2.5. 671301-002-KS-03:05: Theories associated with electricity and electrical installations

Topic Elements to be covered include:

KT0501: **Basic electrical theory** - (Principles and fundamental concepts of electricity; Definitions, types, properties and applications of conductors, insulators and semi-conductors; Concepts, theories and principles of electrical circuits; Calculations on basic electrical circuits such as resistance, voltage, current and power; and Basic principles and calculation of magnetism);

KT0502: **Wireways** - (Definition, types, purpose and applications of wireways; General provisions for wireways as prescribed in SANS code of conduct; Regulations and statutory requirements for wiring of premises; Electrical diagrams and symbols; Electrical components and their applications;

KT0503: **Low voltage protection** - (Purpose and application of low voltage protection; Types of low voltage protection; and Low voltage protection parameters and statutory requirements.);

KT0504: **Transformers** - (Theories of single phase wound transformers; Types of single phase transformers including single wound, double wound and auto-transformers; Fundamentals of transformer construction; Transformer cooling systems; Principles of single phase transformer operation; Principles of single phase auto-transformer operation; Transformer losses; Formulas and calculations on input and output of transformers; Maintenance requirements of transformers; Types of three phase transformers and their applications; Construction of three phase transformers; Principles of three phase transformer operation and configuration);

KT0505: **Cables and conductors** - (Types of cable construction including but not limited to impregnated paper insulated (PILCSTA and PILCSWA), cross-linked polyethylene (XLPE), polyvinyl chloride (PVC), low voltage sufex and flexible cables; Cable materials and their functions and characteristics; Identification of cable characteristics and properties; Applications of various types of cable; Installation methods and safe use of cables; Safe transport of cables; Types and applications of insulators; and Types and applications of semi-conductors).

Internal Assessment Criteria:

IAC0501: **Demonstrate an understanding of basic electrical theory**

a. Describe, calculate and interpret fundamental concepts of electricity (Electro motive force, Potential difference, Resistance) using the correct units of measurement and definitions;
b. List types of materials used for conductors, insulators and semi-conductors and describe their mechanical and electrical properties and applications;
c. Describe the factors that influence the resistance of a material;
d. Define and explain, using the correct units of measurement, Ohms law of electricity;
e. Define and explain, using the correct units of measurement, Kirchoffs law of electricity;
f. Manipulate formula to calculate voltage, current and resistance in series/parallel circuits;
g. Name, describe and explain the different types of magnets and their properties;
h. Explain fundamental magnetic concepts by naming the five characteristics of magnetic lines of force and explaining the relationship between flux and fluc density;
h. Describe, with the aid of a drawing, the application of the right-hand grip rule and show how a magnetic field is established when an electrical current flow through a conductor, by using formula, calculate the force on a current carrying conductor

IAC0502: **Reflect on the fundamentals of electrical wireways**

a. List, identify and explain the meaning of all standard International Electrical Code (IEC) wiring symbols given on work drawings;
b. Identify electrical components and draw schematic diagrams of installations;

c. State and explain the safety purpose of earthing, fuses, circuit breakers and earth leakage protection unit;
d. Describe the principle of operation of various control systems;
e. Describe the principles of operation of single and three phase circuit breakers and core balance earth leakage relays (wound primaries and straight primaries with tripping relay);
f. Describe the purpose of load distribution, lightning arrestors and energy control units.

IAC0503: **Describe the principles of low voltage protection**

a. Name and describe the types of low voltage protective devices;
b. Describe the operation and functions of low voltage protective devices including thermal overload relays (trips), overload relays with manual and automatic reset and various types of fuses and circuit breakers;
c. Explain, with the aid of circuit diagrams, how single-and three phase electrical installations are protected;
d. Describe the protection applied to low voltage Overhead Lines;
e. Describe the effect of adverse conditions on the operational characteristics of protective devices.

IAC0504: **Describe and explain the fundamentals of transformers**

a. Name and describe the types of single phase transformers;
b. Describe, with the aid of drawings, the construction of single phase transformers;
c. Describe and explain the cooling systems used on transformers;
d. Describe, with the aid of drawings, the principle of operation of single phase transformers in terms of mutual inductance and the henry as the unit of inductance;
e. Explain, with the aid of drawings, the principle of operation of single phase auto-transformers;
f. Describe types of transformer losses and explain their causes and effects; and
g. Calculate the terminal voltage, turns and current ratios for a single-phase transformer.

IAC0505: **Explain the key concepts and principles of using electrical cables**

a. Describe, with the aid of sketches, the different types of cables and their construction, and explain the function of the various materials used;
b. Describe the characteristics and applications of the various types of cables and compare their advantages and disadvantages;
c. Describe the factors affecting the efficiency of cables;
d. Describe and explain the provisions in the SANS 10142-1 Code of Practice for the correct and safe installation and use of the various types of cables;
e. Describe the precautions required when transporting cables;
f. Define the term insulator and describe the characteristics and applications of the various types of insulator materials;
g. Define the term semi-conductor and describe the characteristics and applications of the various types of semi-conductor materials.

3.3. Provider Accreditation Requirements for the Module:

Physical Requirements:
- Normal lecture facilities
- Access to a simulated or controlled work environment

Human Resources Requirements:
- Facilitators of learning must have five years practical experience in the field of overhead track equipment maintenance and construction
- The facilitator/learner ratio must not exceed 1/20

Legal Requirements:
- Normal regulatory requirements applicable to public training facilities

SECTION 3B: PRACTICAL SKILL MODULE SPECIFICATIONS

List of Practical Skill Module Specifications

List of Practical Skills Modules for which Specifications are included:

Number	Title	NQF Level	Credits
671301-002-PM- 01	Maintain overhead track structures and return circuits.	**2**	**57**
671301-002-PM- 02	Perform earthing and bonding on traction systems and transmission lines.	**3**	**20**
671301-002-PM- 03	Afford on-track protection	**2**	**5**
671301-002-PM- 04	Under Supervision perform construction and maintenance of overhead track equipment under isolated and earthed conditions.	**3**	**98**
671301-002-PM- 05	Inspect, do fault finding, installation, repair and adjustment of OHTE under live and/or isolated and earthed conditions.	**4**	**17**
671301-002-PM- 06	Work under isolated and earth conditions and to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC overhead traction equipment (OHTE) and all transmission lines and associated equipment) with a mechanised vehicle/on track machine.	**4**	**52**

Total Practical Skill Credits: **249**

1. 671301-002-PM-01-Maintain overhead track structures and return circuits. (NQF Level: 2)

Purpose of the Module:
The focus of the learning in this module is to build learners ability to apply basic skills required to safely and effectively maintain overhead railway track structures and return circuits.

List of Practical Skills Included in this Module:

Number	Title	Credits
671301-002-PM-01-PS01	119885 Identify, handle and care for electrical systems material in the rail sector	**10**
671301-002-PM-01-PS02	9964 Apply health and safety to a work area	**3**
671301-002-PM-01-PS03	119880 Clean and paint OHTE steel structures under isolated and earthed conditions	**4**
671301-002-PM-01-PS04	113868 Handle and care of electrical earthing gear and related equipment	**2**
671301-002-PM-01-PS05	10252 Identify, inspect, use, maintain and care for engineering hand tools	**6**
671301-002-PM-01-PS06	119889 Work to clearance from "live" high-voltage overhead track equipment to perform maintenance work	**9**
671301-002-PM-01-PS07	8215 Use and care for lifting equipment	**5**
671301-002-PM-01-PS08	114669 Carry out basic electric arc welding in an electrical environment	**8**
671301-002-PM-01-PS09	114616 Carry out basic gas welding, brazing and cutting in an electrical environment	**8**
671301-002-PM-01-PS10	120215 Install a height gauge	**2**

1.1. 671301-002-PM-01-PS01 119885 Identify, handle and care for electrical systems material in the rail sector

Scope of Practical Skill:
Condition for performance:
Given a simulated or controlled work environment where the performance must be carried out:
a. Under different weather conditions. b. During day and night time.
c. Within a specific operational time-span to minimise delays.
d. In different sections of track or sub-stations (e.g. yard layouts, stations, sidings, etc.).
Be Able to:
1. Identify electrical systems material.
2. Handle and care for electrical systems material.
Applied Knowledge
1. Electrical systems include but are not limited to:
Low voltage
High voltage
Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);

- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-01-PS02 9964 Apply health and safety to a work area (Credits: 3)

Scope of Practical Skill:

Condition for performance:
Given a simulated or controlled work environment where:

1. Implications of exposure to hazardous substances and hazards include reference to a possible chain of events that could result from not removing, reducing or reporting a hazard is given;

2. A health and safety program includes hazard identification, risk assessment and a health and safety plan is available;

3. Statutory requirements include current national regulations applicable to construction, including acts and regulations, ordinances, by-laws, directives, standards, guidelines, and codes, issued by a legislative body such as parliament, provincial administrations, local authorities and other bodies so empowered by any of the former is provided;

4. Regarding Acts and Regulations, all pertinent national legislation is included.

Be Able to:

1. Identify potential hazards in the work area.

2. Limit damage to persons or property in the case of an emergency.

3. Follow procedures that apply to illness or injury in the work area.

Applied Knowledge

1. Apply basic health and safety legislation in the form of standards and procedures

governing health and safety in the workplace, to ensure that they contribute to a safe, healthy environment for themselves and others.

1. hazard, "hazardous substance, risk and safe as described in the Occupational Health & Safety Act (Act no. 85 of 1993), and the relationship between the three concepts.

2. Statutory requirements.

3. Workman’s compensation procedures.

4. Relevant national regulations.

5. Health and safety regulations.

6. The implications of not following procedure that apply to illness or injury in the work area.

7. Health and safety planning.

8. The use of protective clothing.

9. The use of fire extinguishers.

10. Procedures for incident reporting and recording.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-01-PS03 119880 Clean and paint OHTE steel structures under isolated and earthed conditions (Credits: 4)

Scope of Practical Skill:

Condition for performance:
Given a simulated or controlled work environment with all the required:

a. Personal protective equipment

b. Train protection equipment

c. Fire-fighting equipment

d. First aid equipment

Be Able to:

1. Communicate clearly and concisely with relevant role players and complete relevant

documentation.

2. Prepare to clean and paint OHTE steel structures.

3. Clean and paint OHTE steel structures according to company-specific instructions and manufacturers specifications.

4. Finalise the cleaning and painting of OHTE steel structures.

Applied Knowledge

1. Train Working Rules

2. Electrical Safety Instructions (Authorisation)

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-01-PS04 113868 Handle and care of electrical earthing gear and related equipment (Credits: 2)

Scope of Practical Skill:

Condition for performance:
Given a simulated or controlled work environment where handling, inspection, cleaning and

storing of electrical earthing gear and related equipment is required. Earthing gear may include but is not limited to: Low Voltage earthing gear. Medium Voltage earthing gear. High Voltage earthing gear. Equipotential earthing gear. Related equipment includes: Insulated operating rods (earthing stick, telescopic link stick, operating handle).

Be Able to:

1. Demonstrate knowledge of portable electrical earthing gear.

2. Identify and handle portable electrical earthing gear.

3. Inspect and care of portable earthing gear.

4. Inspect, handle and care of insulated operating rods.

Applied Knowledge

1. Housekeeping techniques

2. Skills of storage and stacking

3. All required OHS techniques and rules

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-01-PS05 10252 Identify, inspect, use, maintain and care for engineering hand tools (Credits: 6)

Scope of Practical Skill:

Condition for performance:
Given a simulated or controlled work environment with the appropriate engineering hand

tools such as:

- Hand tools include, but are not limited to: hand saws, hammers, screw drivers, sockets, spanners, chassis punches, side cutters, pliers, wire strippers, drill bits, measuring and marking off tools, fastening tools.
- Application include but is not limited to dismantling (loosening, tightening of bolts) cutting.

Be Able to:

1. Identify and select engineering hand tools.

2. Inspect engineering hand tools for serviceability.

3. Use engineering hand tools.

4. Maintenance and care of engineering hand tools.

Applied Knowledge

1. Electrical safety practices

2. Work site procedures and standards

3. A broad understanding of types and uses of engineering tools.

4. A comprehensive understanding of safety rules and regulations.

5. A basic understanding of personal protective equipment necessary when using certain types of hand tools.

6. Correct application and use of specified tools.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-01-PS06 119889 Work to clearance from "live" high-voltage overhead track equipment to perform maintenance work (Credits: 9)

Scope of Practical Skill:

Condition for performance:
A simulated or controlled work environment:

a. Under different weather conditions.

b. During day and night time.

c. Within a specific operational time span to minimise delays.

d. In different yard layouts/stations/sidings/sections.

e. By all infrastructure personnel.

Be Able to:

1. Work safely to clearance from live high-voltage overhead track equipment.

2. Identify and react upon signs and warning boards related to high-voltage overhead track equipment.

3. Apply and remove portable earth connections on high-voltage electrical systems under supervision.

4. Perform switching on high-voltage electrical systems under supervision.

Applied Knowledge

1. Work to clearance safely from live high-voltage overhead track equipment.

2. Work on high-voltage overhead track equipment under isolated and earthed conditions.

3. The identification and reaction to signs and warning boards related to high-voltage overhead track equipment.

4. The identification and verification of OHTE bonding in a track-circuited area.

5. The identification of high-voltage OHTE and related sub standards.

6. Sub-standards reporting procedures.

7. The use of communication media (radios, hand signals etc.).

8. Earthing procedures on high-voltage overhead track equipment.

9. Switching procedures and instructions on high-voltage overhead track equipment under supervision.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-01-PS07 8215 Use and care for lifting equipment (Credits: 5)

Scope of Practical Skill:

Condition for performance:
Given a simulated or controlled work environment where various lifting equipment must be

used to lift, move and stack materials, equipment and components.

Be Able to:

1. Prepare for selecting and using lifting equipment

2. Carry out lifting procedure

3. Care for and store lifting equipment

Applied Knowledge

1. Basic knowledge of the safe handling of lifting equipment.

2. Basic knowledge of determining safe working loads, slinging and stacking methods.

3. Basic knowledge and principles of safety procedures.

671301-002-PM-01-PS08 114669 Carry out basic electric arc welding in an electrical environment (Credits: 8)

Scope of Practical Skill:

Condition for performance:
Given a simulated or controlled work environment with all the material, tools and equipment

to execute basic arch welding.

- Electric arc welding is limited to mild steel with a maximum thickness of 6mm.
- Electric arc welding techniques include but are not limited to: Butt joints.
- Lap joints.
- Fillet joints (T-joints).
- Portable electric arc welding machines include but are not limited to: Air-or oil cooled types.
- Single phase AC units.
- Welding equipment includes but is not limited to: Welding cables.
- Electrode holder and earth clamp. Chipping hammer.
- Related materials include, but are not limited to:
- Electrodes (welding rods).
- Metal surface cleaning materials (files, wire brush, emery cloth, rags).
- Safety equipment include but are not limited to: Arc welding helmets and welding screens. Leather gloves and aprons.

Be Able to:

1. Set up an electric arc welder for welding different metal thickness.

2. Identify and select the correct welding rods for the required application.

3. Join mild steel plates with the aid of basic down hand welding techniques.

4. Care for electric arc welding equipment.

Applied Knowledge

1. Names, applications and functions of electric arc welding machines and equipment.

2. Handling procedures related to electric arc welding equipment.

3. Application of various types of electrodes and current settings during the electric arc welding process.

4. Safe work procedures and workshop practices.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;

- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-01-PS09 114616 Carry out basic gas welding, brazing and cutting in an electrical environment (Credits: 8)

Scope of Practical Skill:

Condition for performance:
Given a simulated or controlled work environment with all the tools, equipment and materials to perform basic gas welding:

• Gas welding, brazing and cutting includes the use of oxygen/acetylene equipment only. Gas welding is limited to:

• Butt welds on mild steel (maximum thickness of 3mm).

• Butt-and lap welds on copper (maximum thickness of 8mm). Brazing is limited to mild steel only (maximum thickness of 3mm).

• Gas cutting is limited to mild steel only (maximum thickness of 6mm).

• Gas welding, brazing and cutting equipment includes, but is not limited to: Oxygen-and acetylene gas cylinders and keys.

• Gas regulators and flashback arrestors. Rubber gas hoses and clamps.

• Gas welding, brazing and cutting torches and nozzles. Nozzle cleaning equipment.

• Spark lighter.

• Related materials include, but are not limited to:

• Gas welding and brazing filler material (welding and brazing rods). Gas welding and brazing flux.

• Metal surface cleaning materials (wire brush, emery cloth, chemicals).

• Safety equipment includes but is not limited to: Gas welding goggles.

• Leather aprons and boot protectors. Safety gloves.

• Overalls.

Be Able to:

1. Prepare for gas welding, brazing or cutting.

2. Describe and demonstrate down hand gas welding techniques for different metals.

3. Describe and demonstrate down hand brazing processes for different metals.

4. Describe and demonstrate the gas cutting process for mild steel.

Applied Knowledge

1. Types of gas welding nozzles, gas pressure-and flow settings per application.

2. Types of brazing nozzles, gas pressure-and flow settings.

3. Operation of cutting torch and types of cutting nozzles, gas pressure-and flow settings.

4. The properties and expansion characteristics of different metals during welding, brazing or cutting.

5. Safe work procedures and workshop practices.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-01-PS10 120215 Install a height gauge (Credits: 2)

Scope of Practical Skill:

Condition for performance::
Given a simulated or controlled work environment with all the tools, equipment and materials to perform basic gas welding:

• Gas welding, brazing and cutting includes the use of oxygen/acetylene equipment only. Gas welding is limited to:

• Butt welds on mild steel (maximum thickness of 3mm).

• Butt-and lap welds on copper (maximum thickness of 8mm). Brazing is limited to mild steel only (maximum thickness of 3mm).

• Gas cutting is limited to mild steel only (maximum thickness of 6mm).

• Gas welding, brazing and cutting equipment includes, but is not limited to: Oxygen-and acetylene gas cylinders and keys.

• Gas regulators and flashback arrestors. Rubber gas hoses and clamps.

• Gas welding, brazing and cutting torches and nozzles. Nozzle cleaning equipment.

• Spark lighter.

Be Able to:

1. Communicate with relevant role players and complete relevant documentation.

2. Prepare to install a height gauge.

3. Install a height gauge according to company specific instructions and procedures.

4. Finalise the installation of a height gauge.

Applied Knowledge

1. Techniques and processes for the installation of a height gauge.

2. The identification, purpose and function of parts and components of the OHTE.

3. The function, purpose and safe use of tools (hand/power).

4. Material identification and specifications related to a height gauge.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

Provider Accreditation Requirements:

Physical Requirements:

1. Access to the simulated or controlled work environments as set out in the various

conditions for performance of all the module topics in this module.

Human Resources Requirements:

1. Qualified Overhear Rail track equipment tradesperson with at least three years post trade

practical experience in the field.

2. The facilitator/learner ratio must not exceed 1/10

Legal Requirements:

1. Comply with all relevant regulatory requirements applicable to the simulated or controlled

work environments.

671301-002-PM-02-Perform earthing and bonding on traction systems and transmission lines. (NQF Level: 3)

Purpose of the Module:

The focus of the learning in this module is to provide learners the opportunity to practice the skills required to use portable power tools and to perform bonding and earthing on railway overhead track equipment.

List of Practical Skills Included in this Module:

Number	Title	Credits
671301-002-PM-02-PS01	119886 Perform bonding and earthing on 3 KV DC and 25/50KV AC on OHTE	15
671301-002-PM-02-PS02	10255 Select, use and care for power tools	5

671301-002-PM-02-PS01 119886 Perform bonding and earthing on 3 KV DC and 25/50KV AC on OHTE (Credits: 15)

Scope of Practical Skill:

Condition for performance:

Given a simulated or controlled work environment within the railway OHTE sector with all the tools and equipment to install a height gauge:

Be Able to:

1. Communicate clearly and concisely without misunderstanding with relevant role players and complete relevant documentation.
2. Prepare to perform bonding and earthing on 3 KV DC and 25/50KV AC on OHTE.
3. Perform bonding and earthing on 3 KV DC and 25/50KV AC on OHTE according to company specific instructions and manufacturers specifications.
4. Finalise bonding and earthing process on 3 KV DC and 25/50KV AC on OHTE.

Applied Knowledge

1. The purpose and function of negative return systems of OHTE.
2. The purpose and function of negative return systems of OHTE.
3. The bonding and earthing procedures, instructions and manufacturers specifications on OHTE.
4. The identification of components and equipment used for bonding and earthing
5. The function, purpose and safe use of tools (hand and power).

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-02-PS02 10255 Select, use and care for power tools (Credits: 5)

Scope of Practical Skill:

Condition for performance:
Given a simulated or controlled work environment with all the tools, equipment and materials

to perform bonding and earthing operations of OHTE and the following basic conditions: Power source includes pneumatic, hydraulic and electrical.

The range of power tools include but is not limited to drilling machines, grinders, sanders, brushes, riveters, buffs, wrenches (including impact type), saws and tacks.

Caring for power tools includes but is not limited to clamping, changing blades, replacing, adjustment or setting up, cleaning, lubricating and tightening.

Safety precautions include the use of personal protective equipment, electrical and fire protection.

Statutory requirements include but are not limited to SABS, OSH Act and manufacturers specifications.

Be Able to:

1. Select a power tool pertaining to specific job requirements.

2. Use fixed power tools.

3. Use portable power tools.

4. Caring for and storing of power tools and their accessories.

Applied Knowledge

1. Workshop procedures including housekeeping practices according to statutory

requirements.

2. Specific work site safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection.

3. Names, locations and functions of power tools and their accessories.

4. Hazards and preventive precautions associated with power tools.

5. Company quality standards.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

Provider Accreditation Requirements:

Physical Requirements:

1. Access to the simulated or controlled work environments as set out in the various conditions for performance of all the module topics in this module.

Human Resources Requirements:

1. Qualified Overhear Rail track equipment tradesperson with at least three years post trade practical experience in the field.
2. The facilitator/learner ratio must not exceed 1/10

Legal Requirements:

1. Comply with all relevant regulatory requirements applicable to the simulated or controlled work environments.

671301-002-PM-03-Afford on-track protection (NQF Level: 2)

Purpose of the Module:

The focus of the learning in this module is to provide learners an opportunity to practice the skills required to afford on track protection within the railway environment.

List of Practical Skills Included in this Module:

Number	Title	Credits
671301-002-PM-03-PS01	14623 Afford on-track protection	5

671301-002-PM-03-PS01 14623 Afford on-track protection (Credits: 5)

Scope of Practical Skill:

Condition for performance:

Given a simulated or controlled railway work environment where semaphore signals/indicators for rail movement on double lines and colour light signaling for rail movement is utilised under different weather conditions, during day and night time and in different yard layouts/stations/sidings/sections/crossing places. The simulated conditions include:

a. Occupation of lines and protection rendered by Train Control Officers, train failures, train accidents, obstructions on the line, maintenance work on the track/high voltage, etc. track maintenance

level crossings (unprotected - booms/track failures). on-track machinery issuing/storage and usage of detonators (where applicable).

Be Able to:

1. Identify/analyse the situation that requires a specific protection procedure.
2. Afford protection with the correct equipment that relates to specific environment & circumstances.
3. Communicate and record information.
4. Discontinue protection and resume normal working.

Applied Knowledge

1. Principles and theory related to specific situations that require protection
2. Principles and theory related to how protection must be afforded
3. The communication process which is required for a specific situation

4. Safety rules and regulations related to protection that include detonators
5. Relevant elements of POSMOR and specific company rules related to protection
6. Relevant elements of the OHS Act, Act 85 of 1993.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-04-Under Supervision perform construction and maintenance of overhead track equipment under isolated and earthed conditions. (NQF Level: 3)

Purpose of the Module:

The focus of the learning in this module is to provide learners an opportunity to practice the skills required to perform construction and maintenance of overhead track equipment under isolated and earthed conditions.

List of Practical Skills Included in this Module:

Number	Title	Credits
671301-002-PM-04-PS01	120218 Assemble and fit small steelwork to overhead track equipment steel structures under isolated and earthed conditions	**12**
671301-002-PM-04-PS02	120219 Erect, assemble and fit OHTE steelwork under isolated and earthed conditions	**15**
671301-002-PM-04-PS03	120222 Install and secure OHTE switches under isolated and earthed conditions	**11**
671301-002-PM-04-PS04	123469 Prepare and install OHTE conductors under isolated and earthed conditions	**11**
671301-002-PM-04-PS05	119881 Prepare and install a booster return conductor on 25/50 kV AC overhead traction equipment (OHTE) under isolated and earthed conditions	**9**
671301-002-PM-04-PS06	119883 Remove, replace/install and adjust section insulator/phase break/runners on 25/50Kv AC overhead traction equipment (OHTE) under isolated and earthed conditions	**8**
671301-002-PM-04-PS07	119890 Sag and tension overhead conductors on OHTE under isolated and earthed conditions	**12**
671301-002-PM-04-PS08	116253 Operate a truck mounted loader crane	**20**

671301-002-PM-04-PS01 120218 Assemble and fit small steelwork to overhead track equipment steel structures under isolated and earthed conditions (Credits: 12)

Scope of Practical Skill:

Given:

Given a simulated or controlled work environment within the railway OHTE environment with all the required tools, equipment and materials to assemble and fit steelwork:

Be Able to:

1. Communicate with relevant role players and complete relevant documentation.
2. Prepare to assemble and fit small steelwork to OHTE steel structures.
3. Assemble and fit small steelwork on OHTE steel structures according to company specific instructions and manufacturers specifications.
4. Finalise the assembling and fitting of small steelwork on OHTE steel structures.

Applied Knowledge

1. The assembling and installation of small steelwork on OHTE steel structures under isolated and earthed conditions.
2. Assembling diagrams.
3. The identification, purpose and function of parts and components of the OHTE.
4. The function, purpose and safe use of tools (hand and power).
5. Material identification and specifications related to OHTE steel structures.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-04-PS02 120219 Erect, assemble and fit OHTE steelwork under isolated and earthed conditions (Credits: 15)

Scope of Practical Skill:

Condition for performance:
Given a simulated or controlled railway OHTE work environment where steelwork must be

assembled and fitted with all the required materials, tools and equipment, such as:

Be Able to:

1. Communicate clearly and concisely without misunderstanding with relevant role players

and complete relevant documentation.

2. Prepare to erect, assemble and fit OHTE steelwork.

3. Erect, assemble and fit OHTE steelwork according to company specific-instructions and manufacturers specifications.

4. Finalise the erection, assembly and fitting of OHTE steelwork.

Applied Knowledge

1. The erection, assembly and fitting procedures and instructions pertaining to OHTE

steelwork under isolated and earthed conditions.

2. The erection, assembly and fitting procedures and instructions pertaining to OHTE

steelwork under isolated and earthed conditions.

3. The reading of manufacturers assembly drawings.

4. The identification, purpose and function of parts and components of OHTE steelwork.

5. The function, purpose and safe use of tools (hand and power).

6. Material identification and specifications related to OHTE steelwork.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);

- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-04-PS03 120222 Install and secure OHTE switches under isolated and earthed conditions (Credits: 11)

Scope of Practical Skill:

Given:

Given a simulated or controlled railway OHTE work environment where steelwork must be

assembled and fitted with all the required materials, tools and equipment,

Be Able to:

1. Communicate with relevant role players and complete relevant documentation.

2. Prepare to install, secure and adjust OHTE switches.

3. Install, secure and adjust OHTE switches according to company-specific instructions and manufacturers specifications.

4. Finalise the installation, secure and adjustment of OHTE switches.

Applied Knowledge

1. The installation, securing and adjustment of switches on OHTE under isolated and

earthed conditions.

The reading of electrification lay out plan.

The identification, purpose and function of parts and components of the OHTE. The function, purpose and safe use of tools (hand and power).

Material identification and specifications related to OHTE switches.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-04-PS04 123469 Prepare and install OHTE conductors under isolated and earthed conditions (Credits: 11)

Scope of Practical Skill:

Given:

Given a simulated or controlled railway OHTE work environment where OHTE conductors

must be prepared and installed under isolated and earthed conditions

Be Able to:

1. Communicate with relevant role players and complete relevant documentation.

2. Prepare and install OHTE conductors.

3. Prepare and install OHTE conductors according to company-specific instructions and manufactures specifications.

4. Finalise the installation of OHTE conductors.

Applied Knowledge

1. The preparation and installation of conductors on OHTE under isolated and earthed conditions.

2. The reading of electrification layout plan.

3. The identification, purpose and function of parts and components of the OHTE.

4. The function, purpose and safe use of tools (hand and power).

5. Material identification and specifications related to OHTE conductors.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-04-PS05 119881 Prepare and install a booster return conductor on 25/50 kV AC overhead traction equipment (OHTE) under isolated and earthed conditions (Credits: 9)

Scope of Practical Skill:

Given:

Given a simulated or controlled railway OHTE work environment where a booster return conductor on 25/50 kV AC overhead traction equipment (OHTE) under isolated and earthed conditions must be prepared and installed.

Be Able to:

1. Communicate clearly and concisely without misunderstanding with relevant role players and complete relevant documentation.

2. Prepare and install booster return conductors.

3. Prepare and install booster return conductors according to company specific instructions and manufacturers specifications.

4. Finalise the installation process of booster return conductors.

Applied Knowledge

1. The preparation, installation and assembly procedures of booster return conductors on

OHTE under isolated and earthed conditions.

2. The reading of electrification layout plan.

3. The identification, purpose and function of parts and components of the OHTE.

4. The function, purpose and safe use of tools (hand and power).

5. Material identification and specifications related to booster return conductors.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-04-PS06 119883 Remove, replace/install and adjust section insulator/phase break/runners on 25/50Kv AC overhead traction equipment (OHTE) under isolated and earthed conditions (Credits: 8)

Scope of Practical Skill:

Given:

Given a simulated or controlled railway OHTE work environment where section

insulator/phase break/runners on 25/50Kv AC overhead traction equipment (OHTE) under isolated and earthed conditions must be removed, replaced/installed and adjusted.

Be Able to:

1. Communicate with relevant role players and complete relevant documentation.

2. Prepare to remove, replace/install and adjust section insulator/phase break/runners on

25/50Kv AC on OHTE under isolated and earthed conditions.

3. Remove, replace/install and adjust section insulator/phase break/runners on 25/50Kv AC on OHTE under isolated and earthed conditions according to company-specific instructions and manufacturers specifications.

4. Finalise the removal, replacement/installation and adjustment of section insulator/phase break/runners on 25/50Kv AC on OHTE under isolated and earthed conditions.

Applied Knowledge

1. The removal, replacement, installation and adjustment of section insulator/phase

break/runners on 25/50Kv AC on OHTE under isolated and earthed conditions.

2. The removal, replacement, installation and adjustment of section insulator/phase break/runners on 25/50Kv AC on OHTE under isolated and earthed conditions.

3. The reading of phase break manufacturers layout plan.

4. The identification, purpose and function of parts and components of the OHTE.

5. The function, purpose and safe use of tools (hand and power).

6. Material identification and specifications related to phase break/runners.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-04-PS07 119890 Sag and tension overhead conductors on OHTE under isolated and earthed conditions (Credits: 12)

Scope of Practical Skill:

Given:

Given a simulated or controlled Railway OHTE work environment where sagging and

tensioning of overhead cables must be done with all the required material, tools and equipment

Be Able to:

1. Communicate with relevant role players and complete relevant documentation

2. Prepare to sag and tension overhead conductors on OHTE.

3. Sag and tension overhead conductors on OHTE in accordance with company specific procedures and instructions.

4. Finalise the sagging and tensioning of overhead conductors on OHTE.

Applied Knowledge

1. The sag and tension chart.

2. The sagging and tensioning of overhead conductors on OHTE under isolated and earthed conditions.

3. The reading of electrification lay out plan.

4. The identification, purpose and function of parts and components of the OHTE.

5. The function, purpose and safe use of tools (hand and power).

6. Material identification and specifications related to overhead conductors.

671301-002-PM-04-PS08 116253 Operate a truck mounted loader crane (Credits: 20)
Scope of Practical Skill:
Given:
Given a simulated or controlled railway OHTE work environment where material/equipment must be loaded using a truck mounted crane
Be Able to:

1. Demonstrate knowledge of the functions of a truck mounted loader crane.
2. Identify the safety and suitability of the crane.
3. Apply the recognised methods for inspecting and recording the operational fitness of all components of the crane.
4. Operate truck mounted loader crane.

Critical Activities to be Assessed Externally: Applied Knowledge

1. Truck Mounted Loader crane operating procedures and main functions of all major components and systems
2. The maximum operating capacities of the designed working capabilities.
3. Statutory requirements including the Relevant Code of practice and Safety, Health & Environmental legislation
4. Recognized hand signals (and other methods of communication) to direct the crane movements.
5. Selection of crane against environmental restraints

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-05-Inspect, do fault finding, installation, repair and adjustment of OHTE under live and/or isolated and earthed conditions. (NQF Level: 4)

Purpose of the Module:

The focus of the learning in this module is on providing learners an opportunity to practice the skills required to Inspect, do fault find, install, repair and adjust OHTE under live and/or isolated and earthed conditions.

List of Practical Skills Included in this Module:

Number	Title	Credits
671301-002-PM-05-PS01	120232 Fault find and install splices on Overhead Track Equipment (OHTE) conductors under "live" and/or isolated and earthed conditions	**13**
671301-002-PM-05-PS02	120217 Inspect, manufacture, remove, install or replace and adjust and or position droppers on overhead traction equipment (OHTE)	**4**

671301-002-PM-05-PS01 120232 Fault find and install splices on Overhead Track Equipment (OHTE) conductors under "live" and/or isolated and earthed conditions (Credits: 13)

Scope of Practical Skill:

Given:

Given a simulated or controlled work environment where fault finding and installation of splices on Overhead Track Equipment (OHTE) conductors under "live" and/or isolated and earthed conditions is required.

Be Able to:

1. Communicate with relevant role players and complete relevant documentation.
2. Prepare to do fault finding and installation of splices on OHTE conductors under "live" and/or isolated and earthed conditions whilst working independently.
3. Fault find and install splices on OHTE conductors under "live" and/or isolated and earthed conditions according to company specific instructions and manufacturers specifications.
4. Finalise the installation of splices on OHTE conductors (including striking points).

Applied Knowledge

1. The fault-finding procedures of splices on OHTE conductors under isolated and earthed and live conditions.
2. The installing procedures of splices on OHTE conductors under isolated and earthed and live conditions.
3. The reading of electrification layout plan.
4. The identification, purpose and function of parts and components of OHTE conductors.
5. The identification, purpose and function of splices used on OHTE conductors.
6. The function, purpose and safe use of tools (hand and power).
7. Material identification and specifications related to OHTE conductor splices.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);

- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-05-PS02 120217 Inspect, manufacture, remove, install or replace and adjust and or position droppers on overhead traction equipment (OHTE) (Credits: 4)

Scope of Practical Skill:

Given:

Given a simulated or controlled work environment where Inspection, manufacture, removal,

installation or replacement, adjustment and or positioning of droppers on overhead traction equipment (OHTE) is required.

Be Able to:

1. Communicate with relevant role players and complete relevant documentation.

2. Prepare to inspect, manufacture, remove, install/replace and adjust/position overhead droppers.

3. Manufacture droppers.

4. Inspect, remove, install/replace and position/adjust droppers.

5. Finalise the manufacturing, removal, installation/replacement and adjust/position of droppers.

Applied Knowledge

1. A dropper chart.

2. The removing, installing/replacing and positioning of droppers on OHTE under isolated and earthed and live conditions.

3. The manufacturing of droppers for OHTE.

4. The reading of electrification lay out plan.

5. The identification, purpose and function of parts and components of the OHTE.

6. The function, purpose and safe use of tools (hand and power).

7. Material identification and specifications related to OHTE droppers.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-06-Work under isolated and earth conditions and to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC overhead traction equipment (OHTE) and all transmission lines and associated equipment) with a mechanised vehicle/on track machine. (NQF Level: 4)

Purpose of the Module:
The focus of the learning in this module is to provide learners an opportunity to practice the key skills required to Work under isolated and earthed conditions and to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC overhead traction equipment (OHTE) and all transmission lines and associated equipment) with a mechanised vehicle/on track machine.

List of Practical Skills Included in this Module:

Number	Title	Credits
671301-002-PM-06-PS01	119891 Inspect, assemble, remove, replace/install and adjust section insulator runners on 3-kV DC overhead track equipment under LIVE and/or isolated and earthed conditions	**14**
671301-002-PM-06-PS02	119887 Inspect, fault find, remove, install/replace and adjust a steady arm and/or side strain insulator on overhead traction equipment (OHTE) under live and/or isolated and earthed conditions	**11**
671301-002-PM-06-PS03	119892 Measure and set the stagger and height of the contact wire on overhead traction equipment OHTE under live conditions	**12**
671301-002-PM-06-PS04	119888 Work live on 3kV DC OHTE, or to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC OHTE and all transmission lines and associated equipment)	**15**

671301-002-PM-06-PS01 119891 Inspect, assemble, remove, replace/install and adjust section insulator runners on 3-kV DC overhead track equipment under LIVE and/or isolated and earthed conditions (Credits: 14)

Scope of Practical Skill:
Given:
Given a simulated or controlled work environment where the inspection, assembly, removal, replacement/installation and adjustment of section insulator runners on 3-kV DC overhead track equipment under "live" conditions are required.

Be Able to:
1. Communicate with relevant role players and complete relevant documentation.
2. Prepare to inspect, assemble, remove and replace section insulator runners.
3. Inspect, assemble, remove and replace section insulator runners.
4. Finalise the assembling, removal, replacement, installation and adjustment of section insulator and/or runners.

Applied Knowledge
1. The inspection, removal, replacement/installation and adjustment of section insulator runners on OHTE under isolated and earthed or live conditions.

2. The inspection, removal, replacement/installation and adjustment of section insulator runners on OHTE under isolated and earthed or live conditions.
3. The reading of section insulator or phase break manufacturers layout plan.
4. The reading of electrification layout plan and diagrams.
5. Company specific electrical safety instructions.
6. Company specific safe working method.
7. The identification, purpose and function of parts and components of the OHTE.
8. The function, purpose and safe use of tools (hand and power).
9. Material identification and specifications related to section insulator and/or runners.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-06-PS02 119887 Inspect, fault find, remove, install/replace and adjust a steady arm and/or side strain insulator on overhead traction equipment (OHTE) under live and/or isolated and earthed conditions (Credits: 11)

Scope of Practical Skill:

Given:

Given a simulated or controlled work environment where Inspection, fault finding, removal,

installation/replacement and adjustments of a steady arm and/or side strain insulator on overhead traction equipment (OHTE) under "live" and/or isolated and earthed conditions is required.

Be Able to:

1. Communicate with relevant role players and complete relevant documentation.

2. Prepare to inspect, fault find, remove install/replace and adjust a steady arm and/or side strain isolator under "live" and/or isolated and earthed conditions.

3. Inspect, fault find, remove, install/replace and adjust steady arm and/or side strain insulator under "live" and/or isolated and earthed conditions according to company specific instructions and manufacturers specifications.

4. Finalise the inspection, fault finding, removal, installation/replacement and adjustment of steady arm and/or side strain insulator under "live" and/or isolated and earthed conditions.

Applied Knowledge

1. The inspection, fault finding, removal, installation/replacement and adjustment of a steady

arm and/or side strain insulator on OHTE under isolated and earthed or live conditions.

2. The reading of electrification layout plan and diagrams.

3. Company specific electrical safety instructions.

4. Company specific safe working method.

5. The identification, purpose and function of parts and components of the OHTE.

6. The function, purpose and safe use of tools (hand and power).

7. Material identification and specifications related to OHTE steady arms and/or side strain insulators on OHTE.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-06-PS03 119892 Measure and set the stagger and height of the contact wire on overhead traction equipment OHTE under live conditions (Credits: 12)

Scope of Practical Skill:

Given:

Given a simulated or controlled work environment where the Measurement and setting of the

stagger and height of the contact wire on overhead traction equipment OHTE under "live" conditions is required.

Be Able to:

1. Communicate with relevant role players and complete relevant documentation.

2. Prepare to measure and set the stagger and height of the contact wire on OHTE.

3. Measure and set the stagger and height of the contact wire on OHTE in accordance with company specific procedures and instructions.

4. Finalise the measuring and setting of the stagger and the height of the contact wire on

OHTE.

Applied Knowledge

1. The measuring and setting procedures and instructions of the stagger and height of the

contact wire.

2. Safe work procedures and instructions related to the measuring and setting of the stagger and height of the contact wire on OHTE under isolated and earthed or live conditions.

3. The reading of electrification lay out plan.

4. The identification, purpose and function of parts and components of the OHTE.

5. The function, purpose and safe use of tools (hand and power).

6. Material identification and specifications related to overhead conductors

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;
- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

671301-002-PM-06-PS04 119888 Work live on 3kV DC OHTE, or to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC OHTE and all transmission lines and associated equipment) (Credits: 15)

Scope of Practical Skill:

Given:

Given a simulated or controlled work environment where live work on 3kV DC OHTE, or to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC OHTE and all transmission lines and associated equipment) is required:

Be Able to:

1. Work live on 3kV DC OHTE.

2. Work to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV

and 50kV AC OHTE and all transmission lines and associated equipment).

3. Perform switching, testing, and earthing on high-voltage overhead track equipment and all transmission lines and associated equipment.

Applied Knowledge

1. Work live on 3kV DC OHTE.

2. Work to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV

and 50kV AC OHTE and all transmission lines and associated equipment).

3. Work on high-voltage overhead track equipment under isolated and earthed conditions.

4. Identification of and reaction to signs and warning boards related to high-voltage overhead track equipment.

5. Identification and verification of OHTE bonding in a track-circuited area.

6. Identification of high-voltage OHTE and related sub-standards.

7. Sub-standards reporting procedures.

8. Use of communication media (radios, hand signals, etc.).

9. Switching, testing and earthing procedures and instructions on high-voltage overhead track.

Internal Assessment Criteria

- IAC0101 Observe and evaluate the extent to which learners comply with the appropriate procedures and operational protocols;

- IAC0102 Observe and evaluate compliance with regulatory requirements;
- IAC0103 Observe and evaluate the ability to demonstrate an integrated understanding of the theory within a range of practical conditions (Work integrated learning);
- IAC0104 Evaluate the ability to demonstrate understanding of up and down stream impacts of actions;
- IAC0105 Evaluate the effectiveness of problem-solving;
- IAC0106 Evaluate the accuracy and timeliness of reporting and records.

Provider Programme Accreditation Criteria

Physical Requirements:

- Learning provider must demonstrate access to an appropriate lecture facility with all the resources to deliver the required learning as set out in the curriculum;
- Providers must have access to simulated or actual work environments where the practical skills can be developed.

Human Resource Requirements:

- Facilitators of learning must be in possession of a recognised qualification for Railway OHTE Linesperson;
- Facilitators of learning should have a minimum of three years post qualification experience as a practising Railway OHTE Linesperson.
- The facilitator/learner ratio should not exceed 1:15.

Legal Requirements:

- Meet all Occupational Health and safety requirements;
- Meet the requirements of all relevant regulatory specifications.

Exemptions

- No exemptions were identified providers must apply to the AQP to have programmes recognised for purposes of exemption.

671301-002-WM-01 - Overhead track equipment maintenance processes

Purpose of the Module

The focus of the learning in this module is on providing learners the opportunity to gain experience in effectively participating in the OHTE construction and maintenance processes and provide meaningful support to these activities within the railway sector.

List of Experiences included in this module

Number	Title	Credits
671301-002-WM-01-01	Execute basic maintenance and construction support work on OHTE	48
671301-002-WM-01-02	Perform earthing and bonding on traction systems and transmission lines	36
671301-002-WM-01-03	Afford on track protection	8

671301-002-WM-01-01 Execute basic maintenance and construction support work on OHTE

Guidelines for Work Experience

1. Identify, inspect, use, maintain and care for engineering hand tools
2. Identify, handle and care for electrical systems material in the rail sector
3. Apply health and safety to a work area
4. Clean and paint OHTE steel structures under isolated and earthed conditions
5. Work to clearance from "live" high-voltage overhead track equipment to perform maintenance work
6. Carry out basic electric arc welding in an electrical environment
7. Carry out basic gas welding, brazing and cutting in an electrical environment
8. Install a height gauge

Contextual Workplace Knowledge

1. Site specific policies, procedures and rules

Supporting Evidence

1. Completed work schedules and reports and supervisor task observation documents

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671301-002-WM-01-02 Perform earthing and bonding on traction systems and transmission lines

Guidelines for Work Experience

1. Select, use and care for power tools
2. Handle and care of electrical earthing gear and related equipment
3. Perform bonding and earthing on 3 KV DC and 25/50KV AC on OHTE
4. Use and care for lifting equipment

Contextual Workplace Knowledge

1. Site specific policies, procedures and rules

Supporting Evidence

1. Completed work schedules and reports and supervisor task observation documents

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671301-002-WM-01-03 Afford on track protection

Guidelines for Work Experience

1. Utilise semaphore signals/indicators for rail movement on single lines
2. Utilise telegraph orders for safe movement on rail
3. Utilise van Schoor system of train control for safe movement on rail
4. Utilise wooden train staff system of train control for safe movement on rail
5. Utilise radio train order system of train control for safe movement on rail
6. Utilise radio track warrant system of train control for safe movement on rail

7. Utilise radio track warrant system of train control for safe movement on rail
8. Identify/analyse the situation that requires a specific protection procedure.
9. Afford protection with the correct equipment that relates to specific environment & circumstances.
10. Communicate and record information.
11. Discontinue protection and resume normal working.

Contextual Workplace Knowledge

1. Site specific policies, procedures and rules

Supporting Evidence

1. Completed work schedules and reports and supervisor task observation documents

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671301-002-WM-02 - Processes for constructing and maintaining overhead track equipment

Purpose of the Module

The focus of the learning in this module is on providing learners an opportunity to gain experience in performing technical work associated with OHTE construction and maintenance in the railway sector.

List of Experiences included in this module

Number	Title	Credits
671301-002-WM-02-01	Under Supervision perform construction and maintenance of overhead track equipment under isolated and earthed conditions.	66

671301-002-WM-02-01 Under Supervision perform construction and maintenance of overhead track equipment under isolated and earthed conditions.

Guidelines for Work Experience

1. Assemble and fit small steelwork to overhead track equipment steel structures under isolated and earthed conditions
2. Erect, assemble and fit OHTE steelwork under isolated and earthed conditions
3. Install and secure OHTE switches under isolated and earthed conditions
4. Prepare and install OHTE conductors under isolated and earthed conditions
5. Prepare and install a booster return conductor on 25/50 kV AC overhead traction equipment (OHTE) under isolated and earthed conditions
6. Remove, replace/install and adjust section insulator/phase break/runners on 25/50Kv AC overhead traction equipment (OHTE) under isolated and earthed conditions
7. Sag and tension overhead conductors on OHTE under isolated and earthed conditions
8. Operate a truck mounted loader crane

Contextual Workplace Knowledge

1. Site specific policies, procedures work instructions and rules

Supporting Evidence

1. Work schedules and reports as well as supervisors task observation reports

671301-002-WM-03 - Specialised OHTE construction and maintenance processes

Purpose of the Module

The focus of the learning in this module is on providing learners an opportunity to gain experience in executing specialised work within the OHTE construction and maintenance function and to become fully competent as a specialised railway OHTE Linesperson.

List of Experiences included in this module

Number	Title	Credits
671301-002-WM-03 01	Inspect, do fault finding, installation, repair and adjustment of OHTE under live and/or isolated and earthed conditions.	**96**
671301-002-WM-03-02	Work under isolated and earth conditions and to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC overhead traction equipment (OHTE) and all transmission lines and associated equipment) with a mechanised vehicle/on track machine.	**48**

671301-002-WM-03-01 Inspect, do fault finding, installation, repair and adjustment of OHTE under live and/or isolated and earthed conditions.

Guidelines for Work Experience

1. Fault find and install splices on Overhead Track Equipment (OHTE) conductors under "live" and/or isolated and earthed conditions
2. Inspect, manufacture, remove, install or replace and adjust and or position droppers on overhead traction equipment (OHTE)
3. Inspect, assemble, remove, replace/install and adjust section insulator runners on 3-kV DC overhead track equipment under LIVE and/or isolated and earthed conditions
4. Inspect, fault find, remove, install/replace and adjust a steady arm and/or side strain insulator on overhead traction equipment (OHTE) under "live" and/or isolated and earthed conditions

Contextual Workplace Knowledge

1. Site specific policies, procedures standards and work instructions

Supporting Evidence

1. Work schedules and reports, legal documents and supervisors task observation reports.

671301-002-WM-03-02 Work under isolated and earth conditions and to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC overhead traction equipment (OHTE) and all transmission lines and associated equipment) with a mechanised vehicle/on track machine.

Guidelines for Work Experience

1. Measure and set the stagger and height of the contact wire on overhead traction equipment OHTE under "live" conditions
2. Work live on 3kV DC OHTE, or to clearance from exposed "live" high-voltage electrical equipment (3kV DC, 25 kV and 50kV AC OHTE and all transmission lines and associated equipment)

Contextual Workplace Knowledge

1. Site specific policies, procedures standards and work instructions

Supporting Evidence

1. Work schedules and reports, legal documents and supervisors task observation reports.